December 2002~~July 1995~~

SPERM WHALE (*Physeter macrocephalus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Sperm whales are found throughout the world's oceans in deep waters ~~from~~ between about 60° N and 60° S latitudes (Leatherwood and Reeves 1983; Rice 1989; Whitehead 2002). Seasonal aerial surveys confirm that sperm whales are present in the northern Gulf of Mexico in all seasons, but sightings are more common during the summer months (Mullin *et al.* 1991; Davis ~~et al., in preparation~~ and Fargion 1996).

There has been speculation, based on year-round occurrence of strandings, opportunistic sightings, and whaling catches, that sperm whales in the Gulf of Mexico may constitute a distinct stock (Schmidly 1981), but there is no information on stock differentiation. The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to delineate stock structure within the Gulf of Mexico, nor to differentiate this stock from the Atlantic stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). Estimated abundance of sperm whales by survey year was 143 (Coefficient of variation (CV)=0.58) in 1991, 931 (CV=0.48) in 1992, 229 (CV=0.52) in 1993 and 771 (CV=0.42) in 1994 (Hansen *et al.* 1995). Survey effort-weighted estimated average abundance of sperm whales for all surveys combined was 530 (CV=0.31) (Hansen *et al.* 1995). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

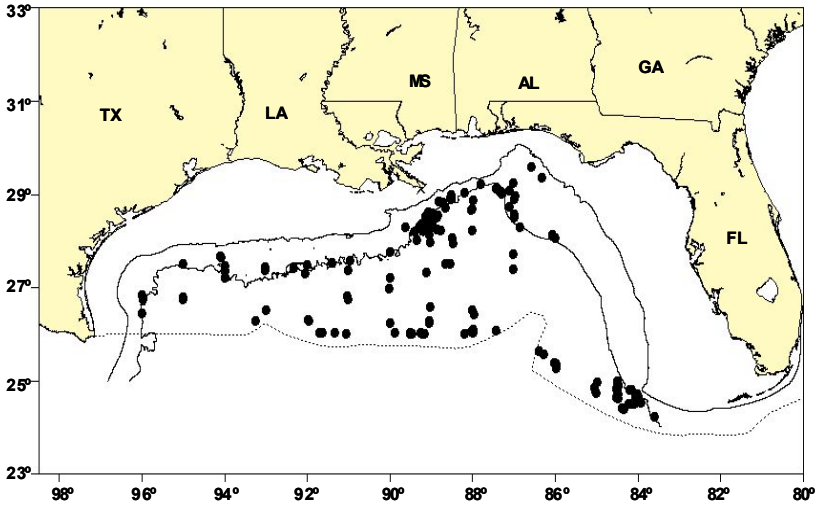

Figure 1. *Distribution of sperm whale sightings from SEFSC shipboard surveys during spring between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line indicates the offshore extent of the U.S. EEZ.*

Surveys were conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using the NOAA ships *Oregon II* (1996, 1997, 1999) and *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered the waters from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1; Mullin and Fulling, in progress). Due

to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate.

The estimate of abundance for sperm whales in oceanic waters, pooled from 1996 to 2001, is 1,315 (CV=0.29) (Mullin and Fulling, in progress), which is the best available abundance estimate for this species in the northern Gulf of Mexico. This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~The minimum population size was estimated from the average estimate abundance which was 127 Fraser's dolphins (CV = 0.90) (Hansen et al. 1995).~~ The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for sperm whales is 1,315 (CV=0.29). The minimum population estimate for the northern Gulf of Mexico is 1,035 (CV=0.29) sperm whales.

Current Population Trend

~~No trend was identified in the annual abundance estimates. There were no observations of Fraser's dolphins during 1991 and 1993 vessel surveys, and the 1992 estimate is based on only one observation (Hansen et al. 1995); however, five other sightings of Fraser's dolphins were documented in the northern Gulf of Mexico during other surveys in 1992, 1993 and 1994 (Leatherwood et al. 1993, SEFSC unpublished data). The apparent differences in abundance estimates may have been caused by low sampling intensity relative to population size (Hansen et al. 1995) or by inter-annual variation in distribution patterns or spatial sampling patterns, rather than changes in population size.~~ There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. ~~therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment~~ For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 1,035 (CV=0.29). The maximum productivity rate is 0.04, the default value for cetaceans. The " recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.1 because sperm whales are an endangered species. PBR for the northern Gulf of Mexico sperm whale is ~~0~~2.1.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing related mortalities of a sperm whale between 1997 and 2001 (Yeung 1999; Yeung, 2001). Observed fishery-related mortality and serious injury for sperm whales is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

~~Available information indicates there likely is little, if any, fisheries interaction with sperm whales in the northern Gulf of Mexico. The total known fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered insignificant and approaching zero mortality and serious injury rate. This determination cannot be made for specific fisheries until the implementing regulations for Section 118 of the MMPA have been reviewed by the public and finalized.~~

A commercial fishery for sperm whales operated in the Gulf of Mexico in deep waters between the Mississippi River delta and DeSoto Canyon during the late 1700's to the early 1900's (Mullin *et al.* 1991), but the exact number of whales taken is not known (Townsend 1935; Lowery 1974). Townsend (1935) reported many records of sperm whales from April through July in the north-central Gulf (Petersen and Hoggard 1996).

Fisheries Information

The level of past or current, direct, human-caused mortality of sperm whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999 and 4% in 2000. There were no reports of mortality or serious injury to sperm whales by this fishery.

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery~~; ~~which operated along the west coast of Florida during 1997-1999, has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

A total of ~~nine~~ 16 sperm whale strandings were documented in the northern Gulf of Mexico between 1997 and 2001. One of the whales had deep, parallel cuts posterior to the dorsal ridge that were believed to be caused by the propeller of a large vessel. This trauma was assumed to be the proximate cause of this stranding. However, there have been no recent strandings with indications of human interactions. Petersen and Hoggard (1996) indicate 22 strandings of sperm whales were recorded in every Gulf state except Alabama and Mississippi prior to 1992. In addition, one three-year old female live stranded in Mississippi in March 1994, and was subsequently euthanized to prevent further suffering due to its compromised body condition (Peterson and Hoggard 1996). Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

STATUS OF STOCK

The status of sperm whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded PBR for the last two years. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping activity is high. Limited studies are currently being conducted to address this issue and its impact, if any, on this and other marine species. The potential impact, if any, of coastal pollution may be an issue for this species in portions of its habitat, though little is known on this to date

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BRYDE'S WHALE (*Balaenoptera edeni*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bryde's whales are considered the tropical and sub-tropical baleen whale of the world's oceans. In the western Atlantic, Bryde's whales are reported from off the southeastern United States and the southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves 1983). Most sightings of Bryde's whales have occurred in the Gulf of Mexico during the spring-summer months (Hansen *et al.* 1995; Davis ~~et al., in preparation~~ and Fargion 1996), but strandings have occurred throughout the year (Jefferson *et al.* 1992).

The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation. It has been postulated that the Bryde's whales found in the Gulf of Mexico may represent a resident stock (Schmidly 1981; Leatherwood and Reeves 1983), but there is no information on stock differentiation.

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). Estimated abundance of Bryde's whales by survey year was 218 (Coefficient of variation (CV)=1.01) in 1991, and zero in 1992, 1993, and 1994 (Hansen *et al.* 1995). Survey effort-weighted estimated average abundance of Bryde's whales for all surveys combined was 35 (CV = 1.10), and was based only on three sightings, all of which occurred in 1991 (Hansen *et al.* 1995). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

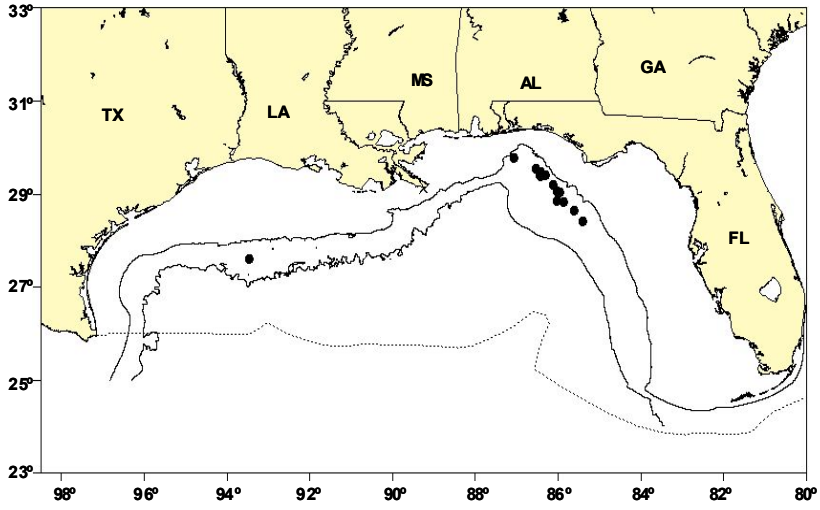

Figure 1. *Distribution of Bryde's whale sightings from SEFSC shipboard surveys during spring between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line indicates the offshore extent of the U.S. EEZ.*

Surveys were conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using the NOAA ships *Oregon II* (1996, 1997, 1999) and the *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered the waters from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1; Mullin and

Fulling, in progress). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate.

The estimate of abundance for Bryde's whales in oceanic waters, pooled from 1996 to 2001, is 42 (CV=0.67) (Mullin and Fulling, in progress), which is the best available abundance estimate for this species in the northern Gulf of Mexico. This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~The minimum population size was estimated from the average estimate abundance which was 127 Fraser's dolphins (CV = 0.90) (Hansen et al. 1995).~~ The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for Bryde's whales is 42 (CV=0.67). The minimum population estimate for the northern Gulf of Mexico is 25 (CV=0.67) Bryde's whales.

Current Population Trend

~~No trend was identified in the annual abundance estimates. There were no observations of Fraser's dolphins during 1991 and 1993 vessel surveys, and the 1992 estimate is based on only one observation (Hansen et al. 1995); however, five other sightings of Fraser's dolphins were documented in the northern Gulf of Mexico during other surveys in 1992, 1993 and 1994 (Leatherwood et al. 1993, SEFSC unpublished data). The apparent differences in abundance estimates may have been caused by low sampling intensity relative to population size (Hansen et al. 1995) or by inter-annual variation in distribution patterns or spatial sampling patterns, rather than changes in population size.~~ There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. ~~therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment.~~ For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 25 (CV=0.67). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5. PBR for the northern Gulf of Mexico Bryde's whale is ~~0.2~~0.3.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been one reported fishing related entanglement of a Bryde's whale (Yeung 1999; Yeung, 2001), but the line was removed and the animal released alive. Observed fishery-related mortality and serious injury for Bryde's whales is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

~~Available information indicates there likely is little, if any, fisheries interaction with Bryde's whales in the northern Gulf of Mexico. The total known fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered insignificant and approaching zero mortality and serious~~

~~injury rate. This determination cannot be made for specific fisheries until the implementing regulations for Section 118 of the MMPA have been reviewed by the public and finalized.~~

Fisheries Information

The level of past or current, direct, human-caused mortality of Bryde's whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999 and 4% in 2000. There were no reports of mortality or serious injury to Bryde's whales by this fishery.

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery, which operated along the west coast of Florida during 1997-1999, has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

There were no reported strandings of Bryde's whales in the Gulf of Mexico between 1997 and 2001. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

STATUS OF STOCK

The status of Bryde's whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded PBR for the last two years.. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

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CUVIER'S BEAKED WHALE (*Ziphius cavirostris*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Cuvier's beaked whales are distributed throughout the world's oceans except for the polar regions (Leatherwood and Reeves 1983; Heyning 1989). Strandings have occurred in all months along the United States east coast (Schmidly 1981) and have been documented throughout the year in the Gulf of Mexico. Beaked whales were seen in all seasons during ~~recent seasonal~~ GulfCet aerial surveys of the northern Gulf of Mexico (Davis ~~et al., in preparation~~ and Fargion 1996). Some of the aerial survey sightings may have included Curvier's beaked whale, but identification of beaked whale species from aerial surveys is problematic.

Strandings of Cuvier's beaked whales along the west coast of North America, based on skull characteristics, are thought to represent members of a panmictic population (Mitchell 1968), but there is no information on stock differentiation in the Gulf of Mexico and nearby waters. In the absence of adequate information on stock structure, a species' range within an ocean should be divided into defensible management units, and such management units include distinct oceanographic regions (Wade and Angliss 1997). Biological information upon which to base stock structure of Cuvier's beaked whales in the Atlantic Ocean and Gulf of Mexico is not adequate; therefore, Cuvier's beaked whales in the Northern Gulf of Mexico are considered a separate stock for management purposes.

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). The seasonal GulfCet aerial surveys included only a small portion of the stock range and these data were not used for abundance estimation. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

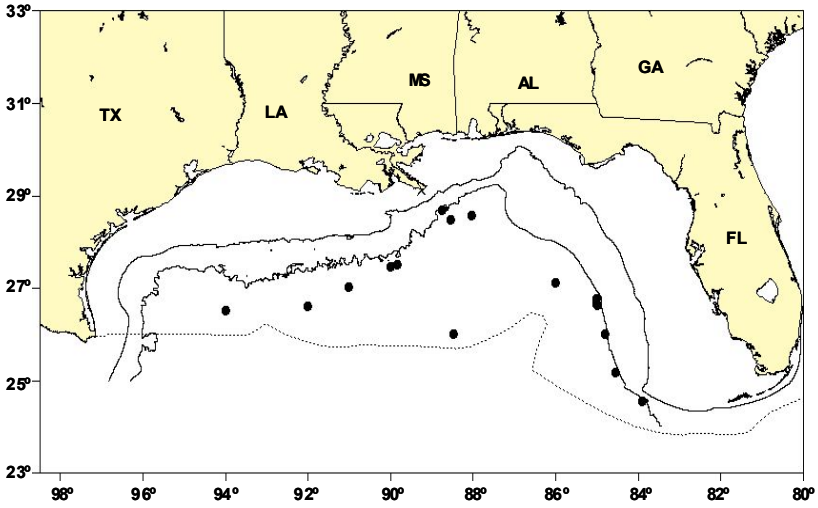

Figure 1. *Distribution of beaked whale sightings Cuvier's beaked whales from SEFSC shipboard surveys during spring between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line indicates the offshore extent of the U.S. EEZ.*

Surveys were conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using the NOAA ships *Oregon II* (1996, 1997, 1999) and the *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered the waters from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly

distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1; Mullin and Fulling, in progress). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate.

The estimate of abundance for Cuvier's beaked whales in oceanic waters, pooled from 1996 to 2001, is 88 (CV=0.52) (Mullin and Fulling, in progress), which is the best available abundance estimate for these species in the northern Gulf of Mexico. The estimated abundance of Curvier's beaked whales is ~~probably low~~ negatively biased because only sightings of beaked whales which could be positively identified to species were used. This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~A minimum population estimate was not calculated because of uncertainty of species identification at sea.~~

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for Cuvier's beaked whales is 88 (CV=0.52). The minimum population estimate for the northern Gulf of Mexico is 58 (CV=0.52) Cuvier's beaked whales.

Current Population Trend

~~There is insufficient information to describe any population trend of this species in the Gulf of Mexico.~~

There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

~~Current and maximum net productivity rates are not known for this stock; therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment~~For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the Cuvier's beaked whales is 58 (CV=0.52). The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor for this stock is 0.5, the default value for species of unknown status. PBR for the northern Gulf of Mexico Cuvier's beaked whale is 0.6.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing related mortality of Cuvier's beaked whales (Yeung 1999; Yeung, 2001). Observed fishery-related mortality and serious injury for Cuvier's beaked whales is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

Fisheries Information

The level of past or current, direct, human-caused mortality of Cuvier's beaked whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of~~

~~trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999 and 4% in 2000. There were no reports of mortality or serious injury to Cuvier's beaked whales by this fishery.

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery, which operated along the west coast of Florida during 1997-1999, has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

Cuvier's beaked whales were taken occasionally in a small, directed fishery for cetaceans that operated out of the Lesser Antilles (Caldwell and Caldwell 1971). There were no reported strandings of Cuvier's beaked whales in the Gulf of Mexico between 1997 and 2001. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

Several unusual mass strandings of beaked whales in North Atlantic marine environments have been associated with naval activities. During the mid- to late 1980's multiple mass strandings of Cuvier's beaked whales (4 to about 20 per event) and small numbers of Gervais' beaked whale and Blainville's beaked whale occurred in the Canary Islands (Simmonds and Lopez-Jurado (1991). Twelve Cuvier's beaked whales that live stranded and subsequently died in the Mediterranean Sea on 12-13 May 1996 were associated with low frequency acoustic sonar tests conducted by the North Atlantic Treaty Organization (Frantzis 1998). In March 2000, 14 beaked whales live stranded in the Bahamas; 6 beaked whales (5 Cuvier's and 1 Blainville's) died (Balcomb and Claridge 2001; Anon. 2001). Four Cuvier's, 2 Blainville's , and 2 unidentified beaked whales were returned to sea. The fate of the animals returned to sea is unknown. Necropsies of 6 dead beaked whales revealed evidence of tissue trauma associated with an acoustic or impulse injury that caused the animals to strand. Subsequently, the animals died due to extreme physiologic stress associated with the physical stranding (i.e., hyperthermia, high endogenous catecholamine release) (Anon. 2001).

STATUS OF STOCK

The status of Cuvier's beaked whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because of evidence of human induced mortality and serious injury associated with acoustic activities. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping or naval activities are high. Limited studies are currently being conducted to address this issue and its impact, if any, on this and other marine species.

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December 2002~~July 1995~~

BLAINVILLE'S BEAKED WHALE (*Mesoplodon densirostris*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Only three species of *Mesoplodon* are known to occur in the Gulf of Mexico, based on stranding or sighting data (Jefferson *et al.* 1992; Hansen *et al.* 1995). These are Blainville's beaked whale (*M. densirostris*), Gervais' beaked whale (*M. europaeus*), and Sowerby's beaked whale (*M. bidens*). The occurrence of Sowerby's beaked whale in the Gulf of Mexico is considered extralimital because there is only one known stranding of this species ~~in the Gulf of Mexico~~ (Bonde and O'Shea 1989) and because it normally occurs in northern temperate waters of the North Atlantic (Mead 1989). Identification of *Mesoplodon* species at sea is problematic; therefore, nearly all sightings of these species are identified as beaked whales and may include sightings of *Ziphius cavirostris* that were not identified as such.

Blainville's beaked whales appear to be widely but sparsely distributed in ~~warm~~ temperate and tropical waters of the world's oceans (Leatherwood *et al.* 1976; Leatherwood and Reeves 1983). Strandings have occurred along the northwestern Atlantic coast from Florida to Nova Scotia (Schmidly 1981), and there have been two documented strandings and one sighting of this species in the northern Gulf of Mexico (Jefferson *et al.* 1992; Hansen *et al.* 1995). Beaked whales were seen in all seasons during ~~recent seasonal~~ GulfCet aerial surveys of the northern Gulf of Mexico from 1993 to 1995 (Davis ~~et al., in preparation~~ and Fargion 1996). ~~There is no information on stock differentiation.~~ The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The total number of *Mesoplodon* spp. beaked whales in the Gulf of Mexico is unknown. However, estimates of the undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) from selected regions of the habitat do exist for select time periods. Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). Estimated abundance of undifferentiated beaked whales by survey year was 129 (Coefficient of variation (CV)=0.78) in 1991, 18 (CV=1.27)

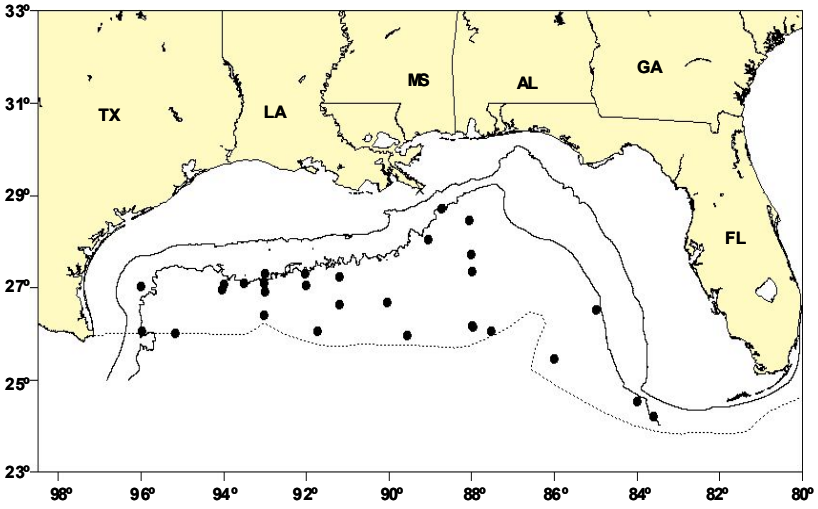

Figure 1. *Distribution of beaked whale sightings (Mesoplodon* spp.*) from SEFSC shipboard surveys during spring between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line indicates the offshore extent of the U.S. EEZ.*

in 1992, 53 (CV=0.78) in 1993 and 287 (CV=0.48) in 1994 (Hansen et al. 1995). Survey effort-weighted estimated average abundance of undifferentiated beaked whales for all surveys combined was 117 (CV=0.38) (Hansen *et al.* 1995). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

Surveys were conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using the NOAA ships *Oregon II* (1996, 1997, 1999) and the *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered the waters from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1; Mullin and Fulling, in progress). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate.

The estimate of abundance for undifferentiated beaked whales in oceanic waters, pooled from 1996 to 2001, is 98 (CV=0.42) (Mullin and Fulling, in progress), which is the best available abundance estimate for these species in the northern Gulf of Mexico. These estimates may also include an unknown number of Cuvier's beaked whales (*Ziphius cavirostris*) and abundance of Blainville's beaked whale cannot be estimated due to uncertainty of species identification at sea. This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~A minimum population estimate was not calculated because of uncertainty of species identification at sea.~~

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) is 98 (CV = 0.42). It is not possible to determine the minimum population estimate for only *Mesoplodon* beaked whales. The minimum population estimate for the northern Gulf of Mexico is 70 (CV=0.42) undifferentiated beaked whales.

Current Population Trend

~~There is insufficient information to describe any population trend of this species in the Gulf of Mexico.~~

There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

~~Current and maximum net productivity rates are not known for this stock; therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment.~~For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the undifferentiated complex of beaked whales is 70 (CV=0.42). The maximum productivity rate is 0.04, the default value for cetaceans. The " recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5. PBR for the northern Gulf of Mexico beaked whales is 0.7. It is not possible to determine the PBR for only Blainville's beaked whales.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing related mortality of beaked whales (Yeung 1999; Yeung, 2001). Observed fishery-related mortality and serious injury for beaked whales is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

Fisheries Information

The level of past or current, direct, human-caused mortality of beaked whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999, and 4% in 2000. There were no reports of mortality or serious injury to Blainville's or other beaked whales by this fishery.

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery~~; ~~which operated along the west coast of Florida during 1997-1999~~, ~~has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

There were no reported strandings of beaked whales in the Gulf of Mexico between 1997 and 2001. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

Several unusual mass strandings of beaked whales in North Atlantic marine environments have been associated with naval activities. During the mid- to late 1980's multiple mass strandings of Cuvier's beaked whales (4 to about 20 per event) and small numbers of Gervais' beaked whale and Blainville's beaked whale occurred in the Canary Islands (Simmonds and Lopez-Jurado 1991). Twelve Cuvier's beaked whales that live stranded and subsequently died in the Mediterranean Sea on 12-13 May 1996 were associated with low frequency acoustic sonar tests conducted by the North Atlantic Treaty Organization (Frantzis 1998). In March 2000, 14 beaked whales live stranded in the Bahamas; 6 beaked whales (5 Cuvier's and 1 Blainville's) died (Balcomb and Claridge 2001; Anon. 2001). Four Cuvier's, 2 Blainville's and 2 unidentified beaked whales were returned to sea. The fate of the animals returned to sea is unknown. Necropsies of 6 dead beaked whales revealed evidence of tissue trauma associated with an acoustic or impulse injury that caused the animals to strand. Subsequently, the animals died due to extreme physiologic stress associated with the physical stranding (i.e., hyperthermia, high endogenous catecholamine release) (Anon. 2001).

STATUS OF STOCK

The status of Blainville's beaked whales or other beaked whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because of uncertainty regarding stock size and evidence of human induced mortality and serious injury associated with acoustic activities. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping or naval activities are high. Limited

studies are currently being conducted to address this issue and its impact, if any, on this and other marine species. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

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December 2002~~July 1995~~

GERVAIS' BEAKED WHALE (*Mesoplodon europaeus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Only three species of *Mesoplodon* are known to occur in the Gulf of Mexico, based on stranding or sighting data (Jefferson *et al.* 1992; Hansen *et al.* 1995). These are Blainville's beaked whale (*M. densirostris*), Gervais' beaked whale (*M. europaeus*), and Sowerby's beaked whale (*M. bidens*). The occurrence of Sowerby's beaked whale in the Gulf of Mexico is considered extralimital because there is only one known stranding of this species ~~in the Gulf of Mexico~~ (Bonde and O'Shea 1989) and because it normally occurs in northern temperate waters of the North Atlantic (Mead 1989). Identification of *Mesoplodon* species at sea is problematic; therefore, nearly all sightings of these species are identified as beaked whales and may include sightings of *Ziphius cavirostris* that were not identified as such.

Gervais' beaked whales appear to be widely but sparsely distributed in ~~warm~~ temperate and tropical waters of the world's oceans (Leatherwood *et al.* 1976; Leatherwood and Reeves 1983). Strandings have occurred along the northwestern Atlantic coast from Florida to Nova Scotia (Schmidly 1981), and there have been two documented strandings and one sighting of this species in the northern Gulf of Mexico (Jefferson *et al.* 1992; Hansen *et al.* 1995). Beaked whales were seen in all seasons during ~~recent seasonal~~ GulfCet aerial surveys of the northern Gulf of Mexico from 1993 to 1995 (Davis ~~et al., in preparation~~ and Fargion 1996). ~~There is no information on stock differentiation.~~ The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The total number of *Mesoplodon* spp. beaked whales in the Gulf of Mexico is unknown. However, estimates of the undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) from selected regions of the habitat do exist for select time periods. Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). Estimated abundance of undifferentiated beaked whales by survey year was 129 (Coefficient of variation (CV)=0.78) in 1991, 18 (CV=1.27) in 1992, 53 (CV=0.78) in 1993 and 287 (CV=0.48) in 1994 (Hansen *et al.* 1995). Survey effort-weighted estimated

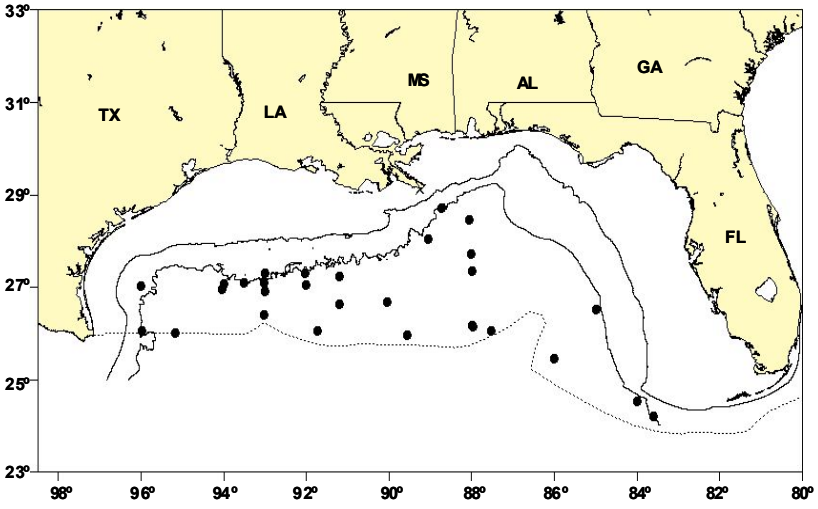

Figure 1. *Distribution of beaked whale sightings (Mesoplodon* spp.*) from SEFSC shipboard surveys during spring between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line indicates the offshore extent of the U.S. EEZ.*

average abundance of undifferentiated beaked whales for all surveys combined was 117 (CV=0.38) (Hansen *et al.* 1995). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

Surveys were conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using the NOAA ships *Oregon II* (1996, 1997, 1999) and *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered the waters from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1; Mullin and Fulling, in progress). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate.

The estimate of abundance for undifferentiated beaked whales in oceanic waters, pooled from 1996 to 2001, is 98 (CV=0.42) (Mullin and Fulling, in progress), which is the best available abundance estimate for these species in the northern Gulf of Mexico. These estimates may also include an unknown number of Cuvier's beaked whales (*Ziphius cavirostris*) and abundance of Gervais' beaked whale cannot be estimated due to uncertainty of species identification at sea. This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~A minimum population estimate was not calculated because of uncertainty of species identification at sea.~~

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* spp.) is 98 (CV=0.42). It is not possible to determine the minimum population estimate for only *Mesoplodon* beaked whales. The minimum population estimate for the northern Gulf of Mexico is 70 (CV=0.42) undifferentiated beaked whales.

Current Population Trend

~~There is insufficient information to describe any population trend of this species in the Gulf of Mexico.~~

There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

~~Current and maximum net productivity rates are not known for this stock; therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment~~For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the undifferentiated complex of beaked whales is 70 (CV=0.42). The maximum productivity rate is 0.04, the default value for cetaceans. The " recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5. PBR for the northern Gulf of Mexico beaked whales is 0.7. It is not possible to determine the PBR for only Gervais' beaked whales.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing related mortality of beaked whales (Yeung 1999; Yeung, 2001). Observed fishery-related mortality and serious injury for beaked whales is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

Fisheries Information

The level of past or current, direct, human-caused mortality of beaked whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999 and 4% in 2000. There were no reports of mortality or serious injury to Gervais' or other beaked whales by this fishery.

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery, which operated along the west coast of Florida during 1997-1999, has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

There were no reported strandings of beaked whales in the Gulf of Mexico between 1997 and 2001. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

Several unusual mass strandings of beaked whales in North Atlantic marine environments have been associated with naval activities. During the mid- to late 1980's multiple mass strandings of Cuvier's beaked whales (4 to about 20 per event) and small numbers of Gervais' beaked whales and Blainville's beaked whales occurred in the Canary Islands (Simmonds and Lopez-Jurado (1991). Twelve Cuvier's beaked whales that live stranded and subsequently died in the Mediterranean Sea on 12-13 May 1996 were associated with low frequency acoustic sonar tests conducted by the North Atlantic Treaty Organization (Frantzis 1998). In March 2000, 14 beaked whales live stranded in the Bahamas; 6 beaked whales (5 Cuvier's and 1 Blainville's) died (Balcomb and Claridge 2001; Anon. 2001). Four Cuvier's, 2 Blainville's , and 2 unidentified beaked whales were returned to sea. The fate of the animals returned to sea is unknown. Necropsies of 6 dead beaked whales revealed evidence of tissue trauma associated with an acoustic or impulse injury that caused the animals to strand. Subsequently, the animals died due to extreme physiologic stress associated with the physical stranding (i.e., hyperthermia, high endogenous catecholamine release) (Anon. 2001).

STATUS OF STOCK

The status of Gervais' beaked whales or other beaked whales in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because of uncertainty regarding stock size and evidence of human induced mortality and serious injury associated with acoustic activities. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping or naval activities are high. Limited studies are currently being conducted to address this issue and its impact, if any, on this and other marine species. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

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BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Gulf of Mexico Outer Continental Shelf Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The Gulf of Mexico Outer Continental Shelf (OCS) bottlenose dolphin stock is assumed to consist of the shallow, warm water bottlenose dolphin ecotype hypothesized by Hersh and Duffield (1990) inhabiting waters over the U.S. OCS in the northern Gulf of Mexico from approximately 9 km seaward of the 18 m isobath to approximately 9 km seaward of the 183 m isobath and from the U.S.-Mexican border to the Florida Keys. The stock range may extend into Mexican and Cuban territorial waters; however, there are no available estimates of either abundance or mortality from those countries. As a working hypothesis, the bottlenose dolphins inhabiting the 0-18 m depth stratum are believed to constitute coastal stocks in the western, northern, and eastern U.S. Gulf of Mexico separate from the OCS stock; however, the OCS stock may overlap with coastal stocks in some areas and may be genetically indistinguishable from those stocks. Limited biopsy samples have been obtained from bottlenose dolphins in the OCS region, which are awaiting analysis.

In addition, the aerial surveys from which the current abundance estimates were derived overlapped the outer continental shelf edge which is believed to be inhabited by the OCS edge and continental slope stock (Fig. 1). This stock is believed to consist of the deep, cold water ecotype described by Hersh and Duffield for the Atlantic (1990). It is not currently possible to differentiate the two ecotypes visually during aerial surveys.

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. Data were collected from 1996-2001 during spring and fall plankton surveys conducted from the NOAA ships *Oregon II* (1996, 1997, and 1999) and *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered shelf waters from the 10 m to the 200 m isobaths in the fall of 1998 and 1999 and were extended into the upper slope waters from 500 m to 1000 m in 2000 and 2001 (Fig. 1 and Table 1; Fulling *et al.* in review). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate for both areas.

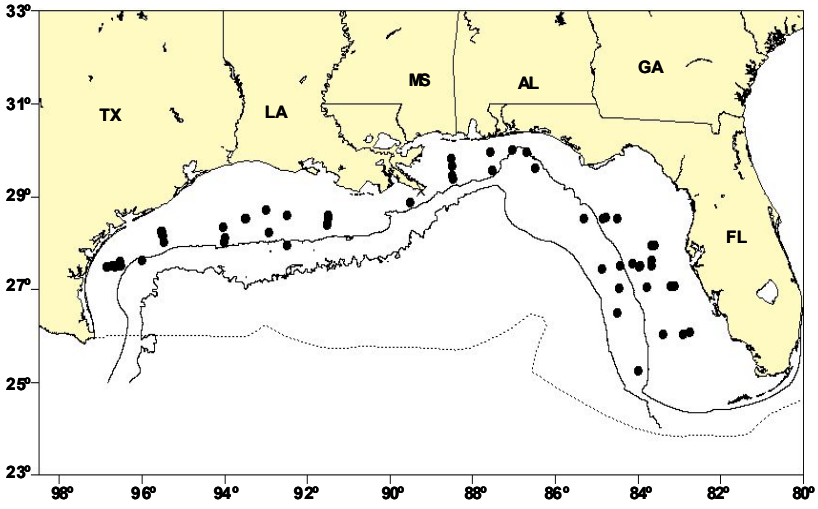

Figure 1. *Distribution of bottlenose dolphin sightings from SEFSC shipboard surveys during spring and fall between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line shows the offshore extent of the U.S. EEZ.*

Atlantic spotted dolphins and bottlenose dolphins are the only two species commonly found in continental shelf waters of less than 200m. ~~Preliminary analyses based on the fall 1992-1994 aerial surveys, provided a bottlenose dolphin abundance estimate of 50,247 dolphins with coefficient of variation (CV) = 0.18.~~ The survey area overlapped with a portion of the area occupied by the OCS edge and continental slope stock which was assumed

to occur in waters over the OCS edge and beyond to the seaward limits of the U.S. Exclusive Economic Zone. This would tend to inflate the abundance estimate, but it is not currently possible to estimate the amount of potential bias. In addition, dolphin species may not always be correctly identified, with some sightings of Atlantic spotted dolphins and bottlenose dolphins confused, resulting in a possible under-estimate of Atlantic spotted dolphins and a potentially over-estimate of bottlenose dolphins (Fulling *et al.* in review).

The best abundance estimate of bottlenose dolphins, pooled from 1998 through 2001, for the outer continental shelf shipboard surveys was 26,852 (CV=0.24) (Fulling *et al.* in review). This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~The minimum population size was estimated using the average abundance estimate of Bottlenose dolphins for all surveys combined which was 3,213 (CV = 0.44) (Hansen et al. 1995).~~The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for bottlenose dolphins is 26,852 (CV=0.24). The minimum population estimate for the northern Gulf of Mexico is 22,002 (CV=0.24) bottlenose dolphins.

Current Population Trend

~~No trend was identified in the annual abundance estimates. There were no sightings of this stock during 1991. The lack of sightings during 1991 may have been due to less sampling that year along the continental shelf edge where sightings of this species were concentrated. The difference in abundance estimates during 1992-1994 were not significant using the criteria of no overlap of log-normal 95 % confidence intervals.~~ There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. ~~therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment.~~ For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a "recovery" factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 22,002 (CV=0.24). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5. PBR for the northern Gulf of Mexico Bottlenose dolphin is ~~432~~220.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

~~There were two documented strandings of Bottlenose dolphins in the northern Gulf of Mexico during 1987-1994 which were classified as likely caused by fishery interactions. However, there have been no recent reports of fishery interactions in stranded animals. Total estimated average annual fishing-related mortality and serious injury of bottlenose dolphins (both species) during 1992-1993 is 1.5 bottlenose dolphins annually (CV = 0.33).~~ There are no observed cases of human-caused mortality and serious injury in this stock; however, based on an observed non-lethal take in U.S. Atlantic waters in 1993 in the pelagic longline fishery, this stock may be subject to incidental take resulting in serious injury or mortality. Fishery interactions have been reported to occur between bottlenose dolphins and the longline swordfish/tuna fishery in the Gulf of Mexico (SEFSC unpublished logbook data) and

annual fishery-related mortality and serious injury to bottlenose dolphins ~~is~~ was estimated to be 2.8 per year (CV=0.74) during 1992-1993. This could include bottlenose dolphins from the outer continental shelf edge and continental slope stock. There has been no reported fishing related mortality of bottlenose dolphins since 1994 (Yeung 1999; Yeung, 2001). Observed fishery-related mortality and serious injury for bottlenose dolphins is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

Fisheries Information

The level of past or current, direct, human-caused mortality of bottlenose dolphins in the northern Gulf of Mexico is unknown; however, interactions between bottlenose dolphins and fisheries have been observed in the northern Gulf of Mexico.

Annual fishing effort for the shrimp trawl fishery in the U.S. Gulf of Mexico OCS during 1988-1993 averaged approximately 2.58 million hours of tows (CV=0.07) (NMFS unpublished data). This fishery was monitored by NMFS observers in 1992 and 1993, but less than 1% of the fishing effort was observed (NMFS unpublished data). There have been no reports of incidental mortality or injury associated with the shrimp trawl fishery in this area.

Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999 and 4% in 2000. There were no observed incidental takes or releases of bottlenose dolphins in the Gulf of Mexico from 1997 to 2001. ~~Estimates of fishery-related mortality and serious injury were based on a generalized linear model (Poisson error assumption) fit to the available observed incidental take for the entire Atlantic longline swordfish/tuna fishery (which includes the Gulf of Mexico) (SEFSC, unpublished data). Takes observed throughout the range of this fishery were used because the species occurs generally throughout the area of the fishery, but observed takes were infrequent in any given region.~~

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery~~; ~~which operated along the west coast of Florida during 1997-1999~~, ~~has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico~~. ~~It is assumed that it is very limited in scope and duration.~~

A trawl fishery for butterfish was monitored by NMFS observers for a short period in the 1980's with no records of incidental take of marine mammals (Burn and Scott 1988; NMFS unpublished data), although an experimental set by NMFS resulted in the death of two bottlenose dolphins (Burn and Scott 1988). There are no other data available.

Other Mortality

The use of explosives to remove oil rigs in the portions of the OCS in the western Gulf of Mexico has the potential to cause serious injury or mortality to marine mammals. These activities have been closely monitored by NMFS observers since 1987 (Gitschlag and Hale, in press; Gitschlag and Herczeg , in press) described the monitoring activities that occurred in 1992. There have been no reports of either serious injury or mortality to bottlenose dolphins (NMFS unpublished data).

STATUS OF STOCK

The status of bottlenose dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded PBR for the last two years. ~~This species is not~~

~~listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock.~~

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ATLANTIC SPOTTED DOLPHIN (*Stenella frontalis*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The Atlantic spotted dolphin is endemic to the Atlantic Ocean in ~~warm~~ temperate to tropical waters (Perrin *et al.* 1987, 1994). ~~Sightings of this species are concentrated along the continental shelf edge and also occur over the continental shelf in the northern Gulf of Mexico; Mullin *et al.* 1991; Southeast Fisheries Science Center (SEFSC) unpublished data].~~ Atlantic spotted dolphins and bottlenose dolphins are the only two species commonly found in continental shelf waters of less than 200 m (Mullin *et al.* 1991). In the Gulf of Mexico, Atlantic spotted dolphins occur primarily from continental shelf waters greater than 10 m deep to slope waters less than 500 m deep (Fulling *et al.* in review). The majority are thought to inhabit the shelf-edge region, though this species has also been reported around oceanic islands and far offshore in other areas (Perrin *et al.* 1994). Atlantic spotted dolphins were seen in all seasons during ~~seasonal recent~~ GulfCet aerial surveys of the northern Gulf of Mexico from 1993 to 1995 (Davis ~~et al., in preparation~~ and Fargion 1996). ~~Atlantic spotted dolphins were~~ This species was also seen in 1992 during regional aerial surveys conducted in the autumns of 1992, 1993 and 1994 over the U.S. continental shelf (Blaylock and Hoggard 1994 ~~for a description of the areas surveyed in 1992-1993~~]). ~~These surveys were designed to estimate abundance of bottlenose dolphins and spotted dolphin abundance was not estimated.~~ It has been suggested that there may be a seasonal movement of this species onto the continental shelf in the spring, but data supporting this hypothesis are limited (Caldwell and Caldwell 1966; Fritts *et al.* 1983).

The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation. Perrin *et al.* (1994) have suggested, however, that the island and offshore animals may be a different stock than those occurring on the continental shelf.

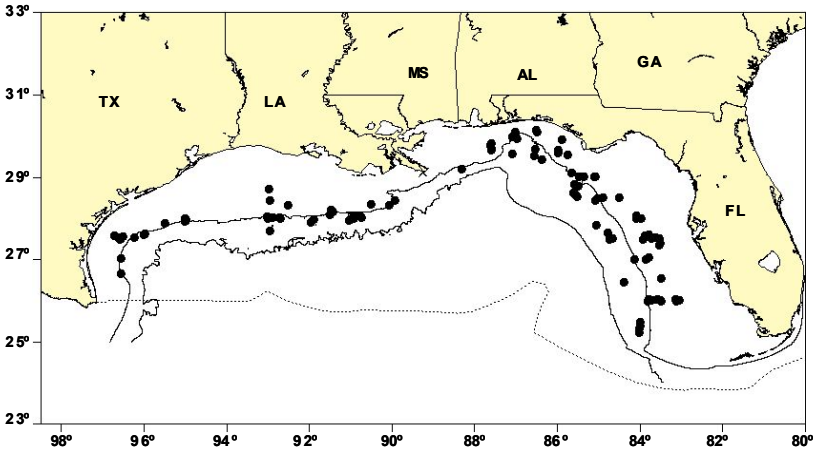

Figure 1. *Distribution of Atlantic spotted dolphin sightings from SEFSC shipboard surveys during spring and fall between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and*

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). Estimated abundance of Atlantic spotted dolphins by survey year was zero in 1991, 4,527 (Coefficient of variation (CV)=0.65) in 1992, 4,618 (CV=0.62) in 1993, and 2,186 (CV=0.85) in 1994 (Hansen *et al.* 1995). Survey effort-weighted estimated average abundance of Atlantic spotted dolphins for all surveys combined was 3,213 (CV=0.44) (Hansen *et al.* 1995). This

is probably an underestimate and should be considered a partial stock estimate because the continental shelf areas were not entirely covered by either the vessel or GulfCet aerial surveys. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

Data were collected from 1996-2001 during spring and fall plankton surveys conducted from the NOAA ships *Oregon II* (1996, 1997, and 1999) and *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered shelf waters from the 10 m to the 200 m isobaths in the fall of 1998 and 1999 and were extended into the upper slope waters from 500 m to 1000 m in 2000 and 2001 (Fig. 1 and Table 1; Fulling *et al.* in review). Surveys were also conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1 and Table 1; Mullin and Fulling, in progress). Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate for both areas.

Dolphin species may not always be correctly identified, with some sightings of Atlantic spotted dolphins and bottlenose dolphins mis-identified, resulting in a possible under-estimate of Atlantic spotted dolphins and a potentially over-estimate of bottlenose dolphins (Fulling *et al.* in review).

Table 1. *Abundance estimates (N_{best}) and Coefficient of Variation (CV) of Atlantic spotted dolphins in the northern U.S. Gulf of Mexico outer continental shelf (OCS) (waters 20-200 m deep) during fall 1998-2001 and oceanic waters (200m to the offshore extent of the EEZ) during spring 1996-2001 (excluding 1998).*

Month/Year	Area	N_{best}	CV
Fall 1998-2001	Outer Continental Shelf	39,307	0.31
Spring 1996-2001	Oceanic	238	0.87
Spring & Fall 1996-2001	**OCS & Oceanic**	**39,545**	**0.31**

The combined estimated abundance of Atlantic spotted dolphins, pooled from 1998 through 2001, for the outer continental shelf shipboard surveys was 39,307 (CV=0.31) (Fulling *et al.* in review). The estimate of abundance for Atlantic spotted dolphins in oceanic waters, pooled from 1996 through 2001, is 238 (CV = 0.87) (Mullin and Fulling, in progress).

The best available abundance estimate for the Atlantic spotted dolphin in the northern Gulf of Mexico is the combined estimate of abundance for both the outer continental shelf and oceanic waters from 1996 to 2001, which is 39,545 (CV = 0.31). This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~The minimum population size was estimated using the average abundance estimate of Atlantic spotted dolphins for all surveys combined which was 3,213 (CV = 0.44) (Hansen et al. 1995).~~ The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for Atlantic spotted dolphins is 39,545 (CV=0.31). The minimum population estimate for the northern Gulf of Mexico is 30,645 (CV=0.31) Atlantic spotted dolphins.

Current Population Trend

~~No trend was identified in the annual abundance estimates. There were no sightings of this stock during 1991. The lack of sightings during 1991 may have been due to less sampling that year along the continental shelf edge where sightings of this species were concentrated. The difference in abundance estimates during 1992-1994 were not significant using the criteria of no overlap of log-normal 95 % confidence intervals.~~ There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. ~~therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment.~~ For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a " recovery" factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 30,645 (CV=0.31). The maximum productivity rate is 0.04, the default value for cetaceans. The " recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5. PBR for the northern Gulf of Mexico Atlantic spotted dolphin is ~~23~~ 307.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

~~There were two documented strandings of Atlantic spotted dolphins in the northern Gulf of Mexico during 1987-1994 which were classified as likely caused by fishery interactions. However, there have been no recent reports of fishery interactions in stranded animals. Total estimated average annual fishing-related mortality and serious injury of spotted dolphins (both species) during 1992-1993 is 1.5 spotted dolphins annually (CV = 0.33).~~ There has been no reported fishing related mortality of spotted dolphins since 1994 (Yeung 1999, Yeung, 2001), when two incidental takes and releases were recorded. Observed fishery-related mortality and serious injury for spotted dolphins is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

Fisheries Information

The level of past or current, direct, human-caused mortality of Atlantic spotted dolphins in the northern Gulf of Mexico is unknown; however, interactions between spotted dolphins and fisheries have been observed in the northern Gulf of Mexico. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~ 3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~ Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999, and 4% in 2000. There were two observed incidental takes and releases of spotted dolphins in the Gulf of Mexico during 1994, but no recent reported ~~observed lethal~~ takes of Atlantic spotted dolphins by this fishery in the Gulf of Mexico. ~~Estimates of fishery-related mortality and serious injury were based on a generalized linear model (Poisson error assumption) fit to the available observed incidental take for the entire Atlantic longline swordfish/tuna fishery (which includes the Gulf of Mexico) (SEFSC, unpublished data). Takes observed throughout the range of this fishery were used because the species occurs generally throughout the area of the fishery, but observed takes were infrequent in any given region.~~ Either spotted dolphin species may have been involved in the observed fishery-related mortality and serious injury incidents, but because of the uncertainty ~~difficulty~~ in species identification by fishery observers, they cannot currently be separated. ~~Estimated mortality and serious injury to spotted dolphins attributable to the longline fishery for the entire fishery (including waters outside of the Gulf of Mexico) for 1993 was 16 (CV = 0.19). Estimated fishery-related mortality and serious injury for the Gulf of Mexico, based on~~

~~proportionality of fishing effort (number of sets) in 1993 was 4.4 spotted dolphins.~~ Estimated average annual fishing-related mortality and serious injury of spotted dolphins attributable to this fishery during 1991-1993 was 1.5 annually (CV=0.33).

~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery, which operated along the west coast of Florida during 1997-1999, has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

A total of 12 Atlantic spotted dolphins stranded in the Gulf of Mexico between 1997 and 2001. There were no indications of human interactions in any of these stranded animals. Some of these stranded animals may have been confused with pantropical spotted dolphins due to similarities with this species. There were two documented strandings of Atlantic spotted dolphins in the northern Gulf of Mexico during 1987-1994 which were classified as likely caused by fishery interactions. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

STATUS OF STOCK

The status of Atlantic spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~ are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded PBR for the last two years. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock.~~ The potential impact, if any, of coastal pollution may be an issue for this species in portions of its habitat, though little is known on this to date

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December 2002~~July 1995~~

PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans (Perrin *et al.* 1987; Perrin and Hohn 1994). Sightings of this species occurred over the deeper waters of the northern Gulf of Mexico, and rarely over the continental shelf or continental shelf edge (Mullin *et al.* 1991; Mullin and Fulling, in progress)~~Southeast Fisheries Science Center (SEFSC) unpublished data~~. Pantropical spotted dolphins were seen in all seasons during ~~recent seasonal~~ GulfCet aerial surveys of the northern Gulf of Mexico between 1993 and 1995 (Davis ~~et al., in preparation~~ and Fargion 1996).

Some of the Pacific populations have been divided into different geographic stocks based on morphological characteristics (Perrin *et al.* 1987; Perrin and Hohn 1994). The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) to sighting data. During 1991 through 1994, line-transect vessel surveys were conducted from spring through summer in the northern Gulf of Mexico from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). This included data collected as part of the GulfCet program (Davis and Fargion 1996). Estimated abundance of pantropical spotted dolphins by survey year was 19,767 (Coefficient of variation (CV)=0.45) in 1991, 15,280 (CV=0.36) in 1992, 29,414 (CV=0.29) in 1993 and 71,847 (CV=0.31) in 1994 (Hansen *et al.* 1995). Survey effort-weighted estimated average abundance of pantropical spotted dolphins for all surveys combined was 31,320 (CV=0.20) (Hansen *et al.* 1995). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations.

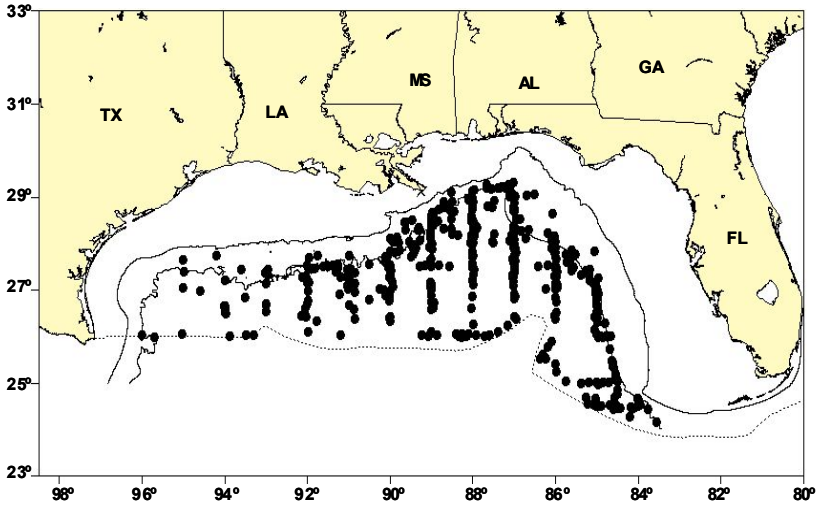

Figure 1. *Distribution of pantropical spotted dolphin sightings from SEFSC shipboard surveys during spring between 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100 m and 1000 m isobaths and the dotted line indicates the*

Surveys were conducted from April to May 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using the NOAA ships *Oregon II* (1996, 1997, 1999) and *Gordan Gunter* (2000, 2001). Tracklines, which were perpendicular to the bathymetry, covered the waters from 200 m to the offshore extent of the U.S. EEZ. Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Fig. 1; Mullin and Fulling, in progress). Due

to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate.

The estimate of abundance for pantropical spotted dolphins in oceanic waters, pooled from 1996 to 2001, is 93,174 (CV=0.19) (Mullin and Fulling, in progress), which is the best available abundance estimate for this species in the northern Gulf of Mexico. This estimate is considered the best because these surveys have the most complete coverage of the species' habitat. The differences between the older (1991-1994) and the more recent (1996-2001) abundance estimates are being investigated. The analytical methods were not completely similar and may have contributed to these differences. A re-analysis of the earlier data is underway so that valid comparisons can be made to look for population trends.

Minimum Population Estimate

~~The minimum population size was estimated from the average estimate abundance which was 127 Fraser's dolphins (CV = 0.90) (Hansen et al. 1995).~~The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). ~~NMFS (Anon. 1994).~~ The best estimate of abundance for pantropical spotted dolphins is 93,174 (CV=0.19). The minimum population estimate for the northern Gulf of Mexico is 79,516 (CV=0.19) pantropical spotted dolphins.

Current Population Trend

~~No trend was identified in the annual abundance estimates. There were no observations of Fraser's dolphins during 1991 and 1993 vessel surveys, and the 1992 estimate is based on only one observation (Hansen et al. 1995); however, five other sightings of Fraser's dolphins were documented in the northern Gulf of Mexico during other surveys in 1992, 1993 and 1994 (Leatherwood et al. 1993, SEFSC unpublished data). The apparent differences in abundance estimates may have been caused by low sampling intensity relative to population size (Hansen et al. 1995) or by inter-annual variation in distribution patterns or spatial sampling patterns, rather than changes in population size.~~There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. ~~therefore, the default maximum net productivity rate of 0.04 (Anon. 1994) was used for purposes of this assessment~~For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 79,516 (CV=0.19). The maximum productivity rate is 0.04, the default value for cetaceans. The " recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5. PBR for the northern Gulf of Mexico pantropical spotted dolphin is ~~265~~795

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There was one documented stranding of a pantropical spotted dolphin in the northern Gulf of Mexico during 1987-1994 which was classified as likely caused by fishery interactions. There has been no reported fishing related mortalities of a pantropical spotted dolphin between 1997 and 2001(Yeung 1999; Yeung, 2001). Observed fishery-related mortality and serious injury for pantropical spotted dolphins is less than 10% of PBR and can be considered insignificant and approaching zero mortality and serious injury rate for this stock.

~~Available information indicates there likely is little, if any, fisheries interaction with pantropical spotted dolphins in the northern Gulf of Mexico. The total known fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered insignificant and approaching zero mortality~~

~~and serious injury rate. This determination cannot be made for specific fisheries until the implementing regulations for Section 118 of the MMPA have been reviewed by the public and finalized.~~

Fisheries Information

The level of past or current, direct, human-caused mortality of pantropical spotted dolphins in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas, and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. Total U.S. longline effort for the Gulf of Mexico pelagic fishery, including OCS edge, continental slope, and Mexican territorial waters, based on mandatory logbook reporting, was ~~4,400 sets in 1991, 4,850 sets in 1992, and 3,260 sets in 1993 (Cramer 1994)~~3,138 sets in 1998, 4,270 sets in 1999 and 4,483 sets in 2000 (Yeung 1999; Yeung, 2001). ~~This fishery has been monitored with about 5% observer coverage, in terms of trips observed, since 1992~~Observer coverage for the Gulf as a percentage of total sets was 2% in 1998, 4% in 1999 and 4% in 2000. There were no reports of mortality or serious injury to pantropical spotted dolphins by this fishery during 1997 to 2001. ~~Pair trawl fishing gear has the potential to capture marine mammals, but there have been no reports of mortality or serious injury to marine mammals in the Gulf of Mexico. This fishery~~, ~~which operated along the west coast of Florida during 1997-1999, has not been observed by NMFS observers, and there are no other data available as to the extent of this fishery in the Gulf of Mexico. It is assumed that it is very limited in scope and duration.~~

Other Mortality

Two pantropical spotted dolphins stranded in the Gulf of Mexico between 1997-2001. There were no indications of human interactions in the stranded animals. Some of these may have been confused with Atlantic spotted dolphin due to similarities with this species. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

STATUS OF STOCK

The status of pantropical spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There ~~and there~~are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded PBR for the last two years. ~~This species is not listed under the Endangered Species Act. The total level of human-caused mortality and serious injury is unknown, but it is believed to be low relative to PBR; therefore, this is not a strategic stock~~

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